In man, there is not, indeed, a habit, but an organ which has lost its uses, yet is still developed in every child brought into the world. The outer ear was formerly provided with muscles by which it could be turned towards any sound for its better recognition. These muscles have become obsolete by heriditary disuse, so that in all normal subjects the ear is motionless. That it could formerly be directed so as the better to receive a sound will the less be denied as it survives in certain exceptional individuals. But as it is absent in the great bulk of our species, the question arises, Why does the external ear not gradually cease to be developed? No one can now contend that it is useful.

J. W. SLATER.

London, England.

Speed of Flight of Birds.

I HAVE always been more or less of a sceptic in regard to the high rate of speed in the flight of certain birds, but I have only just obtained a bit of satisfactory evidence from my own observations. Our wild ducks are admitted to be among our strongest flyers, but I am satisfied that the buffle-head (*Charitonetta albeola*) does not attain a speed of forty miles per hour. While travelling on the Baltimore and Ohio Railway, up the valley of the Potomac, on Jan. 3, I saw a great many ducks, nearly all of which were buffle-heads. Those who are familiar with the road will recall how closely it follows the windings of the river, so that a bird flying up mid-stream would travel just the same distance as the train on the bank. It so happened that, on rounding a sharp curve, my train flushed a pair of buffle-heads, which started up stream at full speed. On watching them I found that, instead of leaving us behind, we were actually beating them, and I am confident that their rate of speed was not equal to that of the train. We kept alongside of them for nearly a minute before they turned back down-stream. Careful calculation showed that the train was running at about thirty-seven miles per hour, so that the rate of speed for those wild ducks would be about thirty-six. I hope that others may have some evidence on this question of speed in flight which will throw more light on the subject.

HUBERT LYMAN CLARK.

Pittsburgh, Pa.

Bowser's Trigonometry.

As I have learned to admire the mathematical text books of Professor Bowser from the excellent results I have had from their class room use for several years, I was surprised to see the somewhat adverse criticism of his Trigonometry in *Science* of Nov. 25. I disagree with your critic's assertion that the best way to study trigonometry is along the line of its historical development. I believe that such a course of study would be objectionable, because of the long time it would require, and because the student would be compelled to unlearn, if I may so phrase it, many things he would necessarily be called upon to learn if he followed the historical method. It is a recognized pedagogical fact that it is easier to teach correct methods to a student who has never used incorrect methods, than to one who has. To acquire a complete knowledge of trigonometry would undoubtedly require a study of its development, to acquire the knowledge required for its proper and facile use in its many applications, does not require a study of its history.

And accordingly I believe his plan of giving the best results and methods of the best students and workers in trigonometry is to be preferred to a method which requires a student to test and reject what has long before been tested and rejected. I admire Professor Bowser's plan of giving such definitions of the functions as apply to all angles, acute, obtuse or reflex. I think some of the writers on the subject have fallen into a grave error when they give definitions of the functions of acute angles, and afterward modify the definitions to suit obtuse angles.

In Professor Bowser's development of the theoretical part of the subject, he is especially clear. His book is a readable one. He is precise in his statements, and his demonstrations are such as the average student can readily follow—which cannot be said of every book on the subject.

The collection of exercises and examples is an unusually large one, suited to every requirement, while the model solutions are truly model in their methods and arrangement. His chapter on De Moivre's Theorem is more complete than is usually given in text-books, while his final chapter on the application of spherical trigonometry serves at once to show the student its use, and to give him a glimpse of several fascinating branches of mathematics.

Your critic is hardly justified in his claim that Professor Bowser has made several historical mistakes. It is unfortunate that Professor Bowser should imply that Napier was the inventor of what are now called Napierian logarithms; but surely he is right in saying that Briggs introduced the common system in 1615, since it is generally admitted that Briggs lectured on them in that year, though his tables were not published until two years later. And why your critic should object because Professor Bowser, in speaking of addition and subtraction logarithms, refers to Zech's tables, I fail to understand, since Zech's tables are equal if not superior to any others published.

Of course, only a class-room test can determine the merits of a text-book, but this latest book of Professor Bowser is so filled with the many qualities which have made his previous books so successful that I cannot see any reason why it should not meet with a like success. H. L. HODGKINS, Professor of Mathematics.

Columbian University, Washington, D. C., Jan. 5.

Humming-Bird's Food.

IN several recent numbers of *Science* there have been notices of the habit of *Trochilus colubres* feeding on the sap of different trees. I have also noticed the fact, and was interested on becoming acquainted with *T. anna* to find that it also made this a staple article of food during the summer and fall. In this part of California there are few trees yielding a sap save the cottonwood and willow.

During a mountain trip in August, 1890, I found the humming-bird very common in the willows along the creeks, at about 5,000 feet elevation; and was pleased to find that the red-breasted sap-sucker (*Sphyrapicus rufer*) filled the office of *S. varius* to the ruby-throat. The willow thickets were very dense and composed mostly of dwarfish shrubs of *Salix lariolepis*. I forced my way into the interior, and watched the birds; sap-suckers, humming-birds, and warblers (*Dendroica audubonì*), often waiting turns at a favorite drinking-spot; though possibly the latter were more interested in the insects attracted by the honey than by the honey itself. There were often three, and even four or five, humming-birds in sight at a time. They were very tame, and very curious; coming within three or four feet of me, poising themselves on their wings and looking me over. I noticed most of these were young, and that the adult males were quite shy.

Subsequently, while teaching at Dunlap, at about 3,500 feet elevation, I found the birds as late as December feeding in the same manner.

Irrigation seems to have an important influence on the habitat of this bird.

For three years I have lived most of the time in the southern half of Fresno County, in an open plain. For the first two years I saw but very few humming-birds, and never saw them feeding on the native flowers, no matter how showy they were.

Meanwhile, the water had formed a pond by sub-irrigation on the ranch, and the same variety of willow (*Salix lariolepis*), which in the valley forms a tree 40–60 feet high and 3–5 feet in diameter, had come in thickly and grown to about 15 feet in height. This fall I noticed many humming-birds about the place, and traced them to this pond.

I have never seen but one or two sap-suckers here, but I found the birds in great numbers feeding on the sap exuding from the wounds caused by a large borer, the moth of which, about two inches across the wings, colored black and white, was flying about in abundance.

I have not as yet found them feeding upon any tree save this willow. Maples are very scarce in the Sierras of this county, and the sap-suckers prefer willows to any other tree. I have not observed that the squirrels score the bark of trees here as in the

east, so the seeming preference for the willow may be owing to lack of drinking-places elsewhere.

It would be interesting to know if the other species of this genus were addicted to the same habit. Who knows?

ALVAH A. EATON.

Riverdale, Fresno County, Cal., Dec. 26.

A Peculiar Fire.

In *The Ladies' Home Journal* for January is an account of a fire from gasoline that originated in a rather peculiar manner. A lady was cleaning a Brussels carpet with gasoline. She had cleaned about one-third of the carpet when she noticed one spot that looked a little dull and which must have a little more rubbing. She says, "I gave one quick, hard rub, the cloth in my hand ignited. There was a sort of a puff, and the flames went creeping all over the carpet I had cleaned." The explanation suggested was that the friction ignited the gasoline, but no suggestion is made as to whether that was caused by raising the temperature to a high degree as might ordinarily happen by friction or whether it was otherwise.

Some of my experience in the cold, dry climate of Minnesota has suggested a very plausible explanation for this accident, which seems surprising that such accidents are not more frequent. Our sleeping-room has an ingrain carpet from which we get marked electrical experiences. On a cold morning one can hardly take a step without being strongly electrified. By shuffling across the carpet, taking only two steps, I have many times drawn a spark one-eighth of an inch long. By taking a dozen shuffling steps and touching the water faucet I have several times drawn a spark nearly one-half of an inch long. Indeed, it is so common and so excessive that it is quite uncomfortable. I have several times thought seriously of getting up some arrangement for gradually dissipating the charge on one's body, so that we can avoid the unpleasant shock when using the water. It should be stated that this high degree of electrification is not an every-day experience, but it is very common when the thermometer in the room goes below 50° or 40° Fahr.

A similar experience is very common here when one is putting on a fur overcoat or one simply with a fur collar. The simple rubbing of the fur in putting on the coat will so electrify it that one gets a prickly sensation from the charge from the collar when it is turned up against one's neck. Quite frequently simply picking up a flannel undergarment will so electrify it that one hears a decided crackling. These experiences are very common here in Minnesota with the dry atmosphere, and are quite surprising to one accustomed to the more moist climate of New York of the sea-coast.

This experience suggests at once that the gasoline in the case above noted was ignited by an electric spark caused by rubbing the carpet.

G. D. SHEPARDSON.

University of Minn., Minneapolis, Minn.

Electrical Phenomena on Mountains.

THE experience of Mr. Chariton and the relation of Mr. Stone, as given in *Science* Sept. 23 and Dec. 2, have a parallel in the account of a traveller in Italy in 1814, who is quoted in the volume of Inne's Telescope for 1827, under the heading of "Curious Effects of Electricity upon Mount Ætna," and from which I extract as under.

"June 2, 1814. Before midday two travellers were returning from the mountain, guided by Vicenza Carbonaro, one of the guides from Nicolesi. They had arrived in the Piano del Huga, when, expecting a hail-storm, they quickened their pace. Walking on frozen snow, Carbonaro was the most advanced of the party, he felt his hair stand on end, his forehead and the skin of his face felt benumbed, and he heard a hissing noise. He took off his cap and his hair became more bristled, and the whistling noise more powerful The traveller nearest to Carbonaro also heard a humming sound, and asked the guide what it was; he could not give any reason for it, and he stopped, supposing he was dizzy. In the meantime they approached each other and were pleased with the magic sound. The traveller turned to call his companion, who was at a little distance, and made a sign to him with his hand, the hand when raised produced a much stronger sound, so much so, that moving the fingers singularly modulated it. The traveller approached and heard the sound produced by the head and body of his companion, but, not having entered the current of electric air, his repeated attempts produced no sound. Finally, the three persons having joined, they experienced great pleasure, as with moving their fingers they produced the above extraordinary effect. In the meantime the hail-storm fell on them, and, being rather curious than erudite, they resolved to prosecute their journey downwards, without caring to make further investigation. Scarcely had they gone a few paces, advancing beyond the electric air, than the sounds ceased."

GEO. CLULOW.

51 Belsize Avenue, Hampstead, N.W., London, Jan 2.

Maya Codices.

As the controversy between Dr. Seler and myself has drifted into mere criticisms of each others' statements, and no serious attempt to test my interpretations or to show that they are incorrect has been made, I think a continuance on this line would be unprofitable. I therefore close it, on my part, by suggesting to students of the Maya Codices that it might be worth the trouble to test my interpretations by an attempt to apply them in deciphering other combinations. I also call Dr. Seler's attention to the fact, that, notwithstanding his firm belief to the contrary, there is a numeral designation with a cross *between* the dots in the bottom line of Dres. 46,—2 *Kayab*. Moreover, it is precisely of the form shown in his Figs. 17, 19, and 20, *Science*, Jan. 6, 1893.

CYRUS THOMAS.

Washington, D.C., Jan, 16.

BOOK-REVIEWS.

Experimental Evolution. By HENRY de VARIGNY. London and New York, Macmillan & Co. $1.50.

THROUGHOUT the whole line of biological research the progress of advance has been from statical to dynamical science. The first study is always a study of facts of nature as they exist, of their relations to each other and of their history. Later follows the study of nature in motion accompanied by experimental work and an endeavor to modify the activities of nature. Already biologists have inaugurated the science of experimental evolution, and this book by De Varigny is designed to start biologists to the study of a new science which the author calls experimental evolution. This work consists of a series of lectures originally delivered by the author before the Summer School of Art and Science at Edinburgh. The author points out that while the various lines of biological research, embryological, paleontological and morphological, all point in the direction of evolutionary theory, they fail to be conclusive demonstrations of evolution, because no one of them shows us the process of evolution in action. Evolution is an inference from the facts, but not a demonstrated truth. There is needed as a final test experimental study in regard to the production of new species by process of nature. To the discussion of the possibility of this branch of experimentation, these lectures are devoted. The author first summarizes, in an extremely interesting fashion, the chief lines of fact which have been collected in connection with variations of animals in nature. Second, in a similar way, he summarizes and discusses variations which are known in animals under domestication. Third, he endeavors to show how these variations are under the influence of conditions; conditions of environment, conditions of heredity, conditions of interbreeding, etc.; and, last, he tries to point out how it may be possible in the future for the experimenter so to regulate these conditions of environment as to cause at will actual changes to take place in the structure and characteristics of animals and plants which may result in the not too greatly distant future in the production of new species and hence in the final demonstration of a doctrine of evolution. Although largely a compilation the work is withal interspersed with many new and interesting observations made by the author in connection with the subjects discussed, the changes in the structure and